

## OPTIMIZATION OF DIAGNOSTIC DECISIONS IN MEDICINE

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### ABSTRACT

The paper develops a method to optimize medical diagnostic decision-making in the form of algorithms. Taking into account the non-stationary process under study and the lack of information in different situations, the article developed an algorithm to solve this problem as a two-optimization problem. According to this algorithm, the problem optimization selection of diagnostic solutions in every moment of time  $t_i$  is solved taking into account the patient's treatment, designated in previous moments of observation.

The results show that the optimization issues of diagnosing the disease it is advisable to decide together with the task of managing the treatment of patients.

**KEYWORDS:** System, Automated System, External Optimization, Internal Optimization, Optimization, Data Processing, Process, Situation, Condition, Management, Decision-Making, Medical Diagnostics, Therapeutic Process, Expert Knowledge Base

### INTRODUCTION

One of the most important tasks of medical practice is the diagnosis. Correct and timely diagnosis determines the probability of recovery of the patient, and often his escape from death. It is known that the diagnosis is a branch of medicine that studies the methods and principles of establishing a diagnosis by symptoms and signs of disease. Diagnosis includes: collecting diagnostic information (complaints of the patient, the results of the inspection, analysis and research with the help of medical equipment); evaluation of diagnostic data; establishing diagnosis. Diagnosis also the information needed in order to correctly assign treatment. Thus, the diagnosis is a typical cybernetic process related to the collection, transmission, storage and processing of information. It should be noted every year the process of diagnosis is complicated, due to the increase in the incoming flow of information to the doctor.

This shows that to facilitate the work of the doctor is necessary to support the adoption of automated diagnostic solutions that accelerate the process of information processing and offer reasonable options for medical diagnostic solutions. These issues are closely linked to the creation of workstations specialist doctor [1].

It is known that in medical diagnostics decisions in complex situations or situations with incomplete information.

On the one hand, the patient has an unstable character. This means that the patient's condition, or sometimes better or worse In turn this is related to external factors or to physiological changes in the human body.

On the other hand, the constant monitoring of the patient and consideration of all influencing factors on the condition of the patient, in practice, impossible. Therefore, usually the patient survey carried out at discrete times in situations with fuzzy information.

The foregoing shows that the problem of optimizing the diagnostic decision making process in the strict sense is not possible. On this basis, we propose a method for optimizing and managing of diagnostic decision making process, based on the solution of the two-optimization problem.

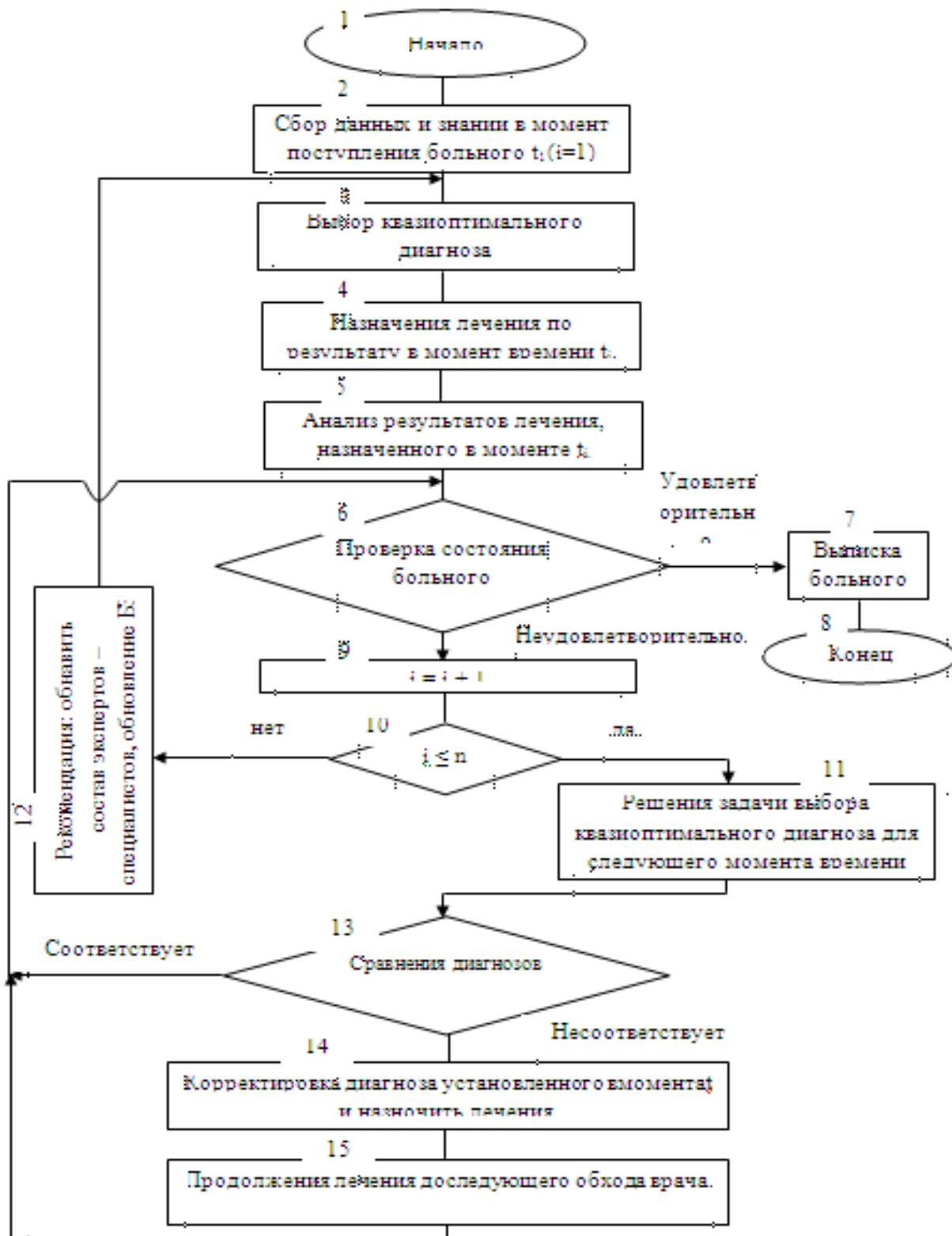
For this observation of the patient is carried out at discrete times  $t_1, t_2, \dots, t_n$ ;  $n$ -number of observation during the treatment period (from patient admission to discharge).

The optimization process includes inner and outer optimization. Internal optimization used to select sub-optimal solutions in moments of observation on complex algorithms and programs developed in [2, 3].

External optimization selection of optimal diagnostic decisions in every moment of time  $t_i$  and the management of the treatment is decided taking into account the actions of the doctor, that is, taking into account the results of treatment intended to point  $t_{i-1}$ . The overall structure of the method optimization and management decision-diagnostic solutions in the form of an algorithm can be represented as in Figure 1. Now we give a brief description of the algorithm to optimize the process of diagnosis and management of the treatment process. Since the beginning of the collected and input the necessary statistics, intelligence and knowledge of experts (Box 2). Further resolved internal problem optimization diagnoses for a moment of time  $t_i$  the algorithm program developed in [2, 3] (Box 3). By decision of the task is assigned to the treatment for the current point in time  $t_i$ . In the next block (5 and 6) analyzed the results of treatment and checks the status of the patient. If the patient's condition is satisfactory, then the treatment is successful and the patient is discharged. If the condition is unsatisfactory, then a transition to the following observation time (block 9). Then (block 10) are checked conditions  $i \leq n$ . Here  $i$ -number of the current observation,  $n$ -the total number of observations that the conditions are met, then the choice problem is solved optimization diagnosis taking into account the following observations (section 11). Next, in block 13 is tested according to the diagnoses established in at  $t_i$  and  $t_{i+1}$ . If both diagnoses match, then continued treatment and re-algorithm works with a 6-block. If it does not, then an adjustment diagnosis and treatment (block 14). Then continue the treatment until the doctor should get the algorithm again runs with 6 blocks.

If block 10 conditions are not met algorithm gives recommendations on the renewal of the expert professionals and updated knowledge base. Next, the algorithm re-runs starting from 2 units.

The above outlined algorithm shows that the problem optimization selection of diagnostic solutions in every moment of time  $t_i$  is solved taking into account the patient's treatment, designated in previous moments of observation.



**Figure 1: Algorithm for Optimization of Diagnostic Decision Making Process Determined by the Medical Doctor**

On this basis, it can be concluded that the issues of optimizing the decision-making process of medical diagnostics it is advisable to decide together with the task of managing the process of treatment of the disease.

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